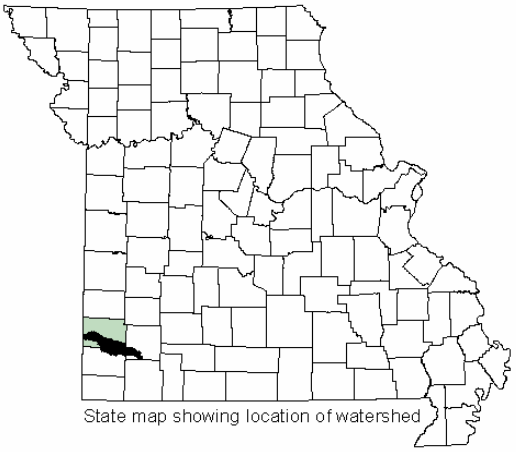
Missouri Department of Natural Resources

Total Maximum Daily Load Information Sheet

Center Creek

Waterbody Segment at a Glance:

County: Jasper
Nearby Cities: Joplin
Length of impairment: 11 miles
Pollutant: Zinc
Source: Tri-State Abandoned Mine Land (AML)


State map showing location of watershed

TMDL Priority Ranking: Medium

Description of the Problem

Beneficial uses of Center Creek

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life
- Protection of Human Health associated with Fish Consumption

Use that is impaired

- Protection of Warm Water Aquatic Life

Standards that apply

- Missouri's Water Quality Standards for zinc can be found in 10 CSR 20-7.031 Table A. The applicable standard is dependent on the hardness of the water and follows the formula:
  Acute: $e^{(0.8473*\ln(\text{Hardness}) + 0.884211)} * 0.978 = \mu g/L$[1] of Dissolved Zinc
  Chronic: $e^{(0.8473*\ln(\text{Hardness}) + 0.785271)} * 0.986 = \mu g/L$ of Dissolved Zinc

Using a hardness of 147 mg/L, the zinc target for the Center Creek watershed (as Missouri's chronic criterion) is 148 µg/L as dissolved zinc. For comparison, Kansas's acute and chronic criteria are 150 µg/L as total recoverable zinc.

Background Information and Water Quality Data

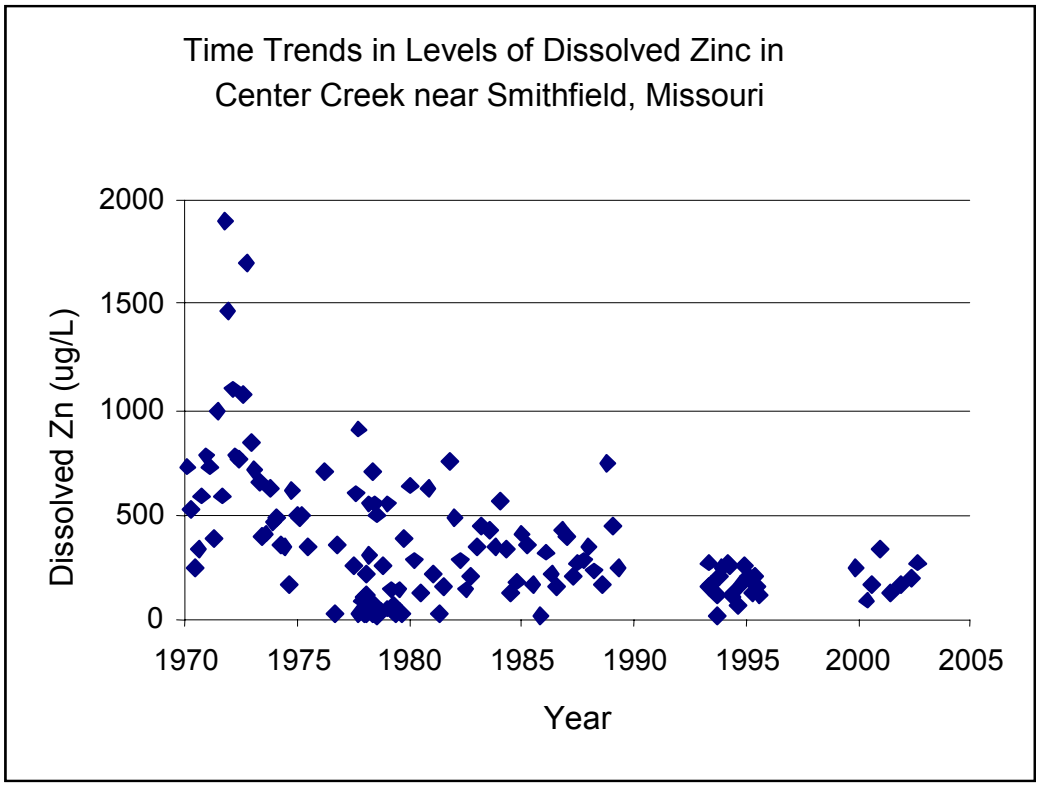
Center Creek flows through the Tri-State Historic Mining District in southwest Missouri. Joplin is located near the center of this district. Mining for lead and zinc began in 1848 and lasted until

[1] µg/L = micrograms per liter, which is the same as parts per billion

1957. Between 1848 and 1945, 50 percent of the zinc and 10 percent of the lead mined world-wide came from the Tri-State district.

Mine drainage, both in the form of surface flows and resurgence of groundwater from flooded mines, contributes significant amounts of zinc to Center Creek. Upstream of the mining district (near Fidelity) the average dissolved zinc concentration in Center Creek is 7 µg/L. At the Highway HH bridge, which is just within the upstream portion of the mining district, it is 124 µg/L and rises to 366 µg/L well within the mining area at Smithfield. Studies by the U.S. Geological Survey (USGS) also indicated that pore water, water within the sediment on the bottom of Center Creek, at some locations was toxic to aquatic life. The results of these toxicity tests correlated with amounts of zinc in the stream sediments, and therefore zinc is believed to be the toxic agent.

Most of the zinc in Center Creek comes from dissolution of zinc minerals lying on the land surface or in the walls of flooded mines. As these surfaces continue to weather, less available zinc minerals remain to be dissolved. As a result, the long-term levels of zinc in runoff, groundwater and Center Creek should decline. This trend is shown in the graphic below that plots dissolved zinc levels in Center Creek near Smithfield from 1970 to 2002.

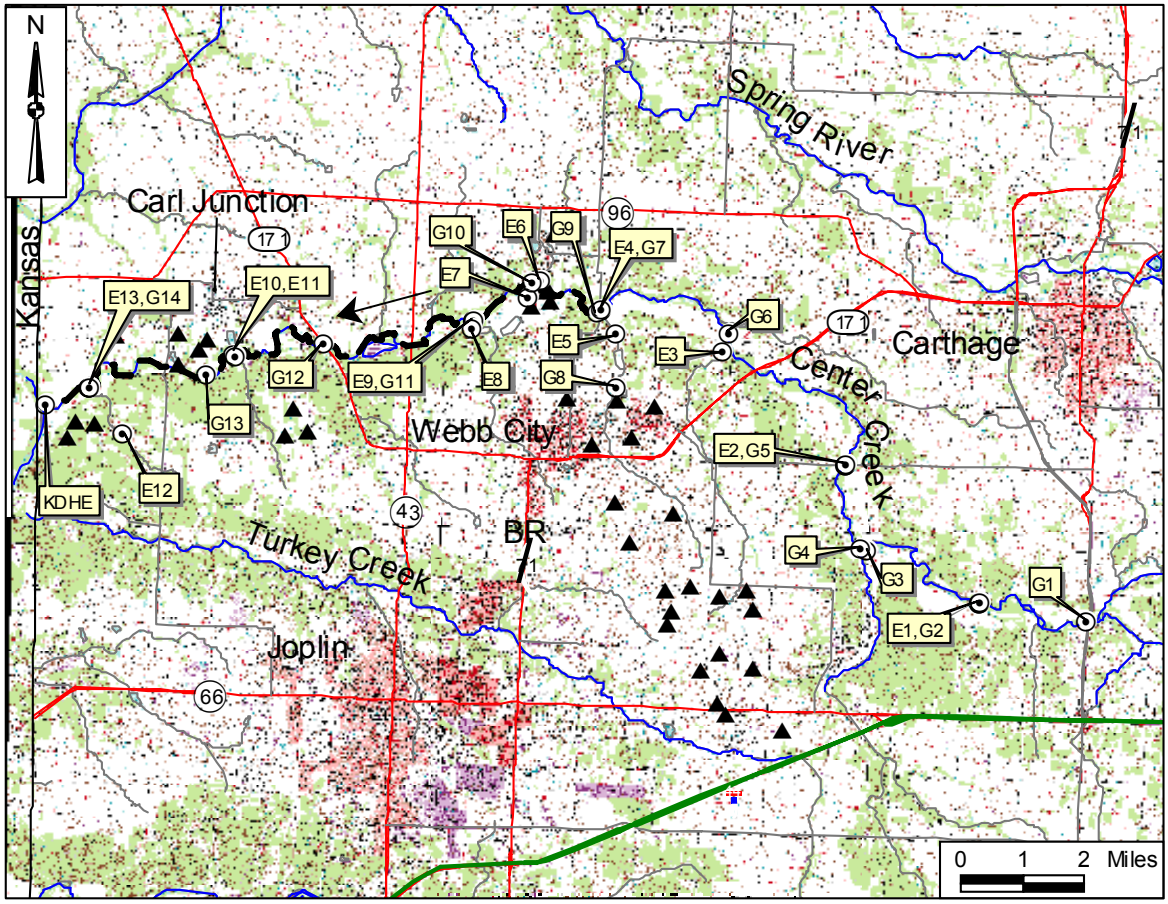


Center Creek and nearby Turkey Creek in Jasper County flow across the state line into the Spring River in Kansas. Kansas has already completed a TMDL study on the Spring River. The two creeks are major sources of metals pollution in the Spring River. As a result, Missouri chose to

include Kansas' water quality standards in the target for these TMDLs. For more information on this, see the Turkey Creek Information Sheet.

The U.S. Environmental Protection Agency (EPA) and USGS collected data on Center Creek at the sites shown in the map below. These data are displayed in the two graphs that follow.

Center Creek in Jasper County, Missouri, Showing the Impaired Segment and Sampling Sites



The site indices are on the next page.

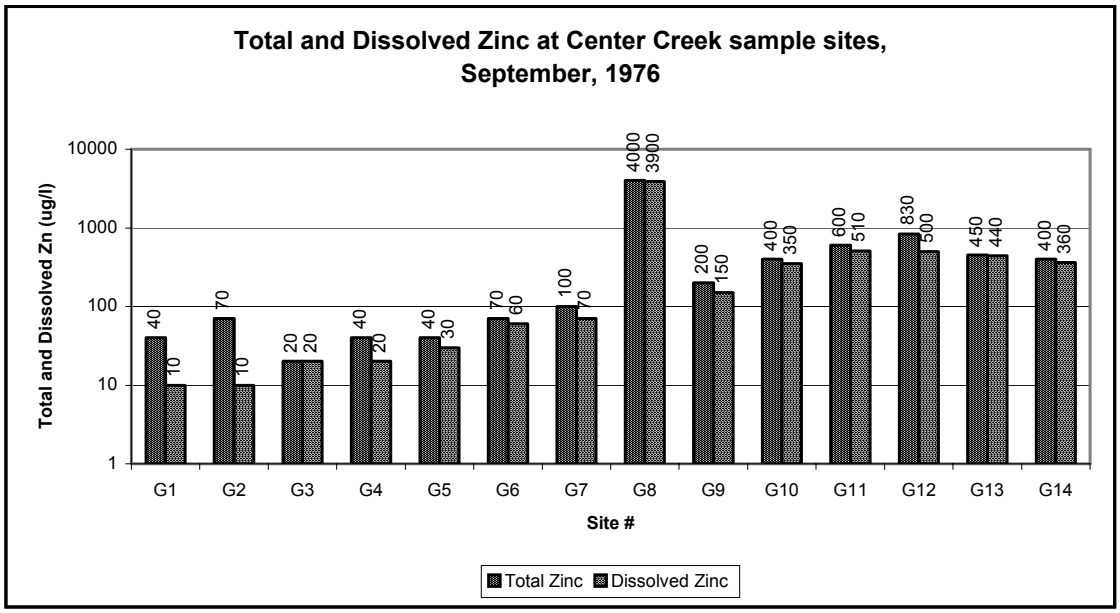
Index to Sites

US-EPA
E1 – Center Creek 2 miles below Fidelity
E2 – Center Creek at Highway HH 1.5 miles below Grove Creek
E3 – Stout's Branch near mouth
E4 – Center Creek 0.1 mile above Mineral Branch
E5 – Mineral Branch 0.5 mile above mouth
E6 – Tributary to Center Creek at Oronogo, near mouth
E7 – Malibu Pit resurgance
E8 – Center Creek 1.5 miles below Oronogo Branch
E9 – Tributary to Center Creek 1.5 miles below Oronogo, near mouth
E10 – Center Creek at Carl Junction
E11 – LBD Tributary to Center Creek at Carl Junction
E12 – LBD Tributary to Center Creek 1 mile below Klondike mines
E13 – Center Creek near Smithfield, 10 miles below Oronogo

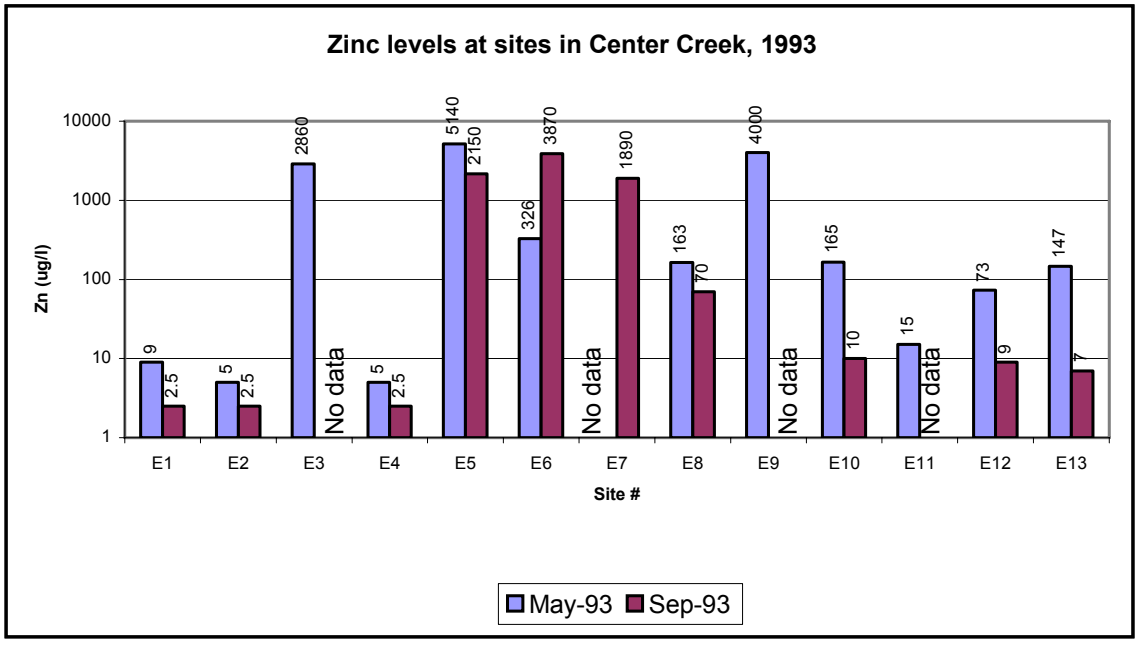
Index to Sites (cont.)

USGS
G1 – Center Creek at Hwy Alt. 71 near Fidelity
G2 – Center Creek 2.5 miles below Fidelity
G3 – Center Creek 0.1 mile above Grove Creek
G4 – Center Creek 0.1 mile below Grove Creek
G5 – Center Creek at Hwy HH 1.5 miles below Grove Creek
G6 – Center Creek 0.1 mile below Stout's Branch
G7 – Center Creek 0.1 mile above Mineral Branch
G8 – Mineral Branch 2 miles above mouth
G9 – Center Creek 0.1 mile below Mineral Branch
G10 – Center Creek 0.1 mile below Oronogo Branch
G11 – Center Creek 1.5 miles below Oronogo Branch
G12 – Center Creek 4.5 miles below Oronogo Branch
G13 – Center Creek at Carl Junction 8 miles below Oronogo Branch
G14 – Center Creek near Smithfield, 10 miles below Oronogo Branch

Kansas Department of Health and Environment
KDHE – Center Creek near Smithfield



Source: US Geological Survey



Source: U.S. Environmental Protection Agency

Many data were not included in this Information Sheet due to space constraints. For more recent data, see the assessment sheet for the 2004-06 303(d) list at: www.dnr.mo.gov/env/wpp/waterquality/303d/2004/303d-info-sheets.htm.

For all of the data used to calculate the TMDL, please refer to Appendix D in the TMDL document.

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